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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/725,453	11/30/2000	Marco Ebert	00236	9472

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EXAMINER	
KILKENNY, TODD J	
ART UNIT	PAPER NUMBER
1733	//

DATE MAILED: 04/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/725,453	EBERT ET AL.	
	Examin r	Art Unit	
	Todd J. Kilkenny	1733	

-- The MAILING DATE of this communication app ars on the cov r she t with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24-46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24-46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11-30-00* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Objections

1. Claims 45 and 46 are objected to because of the following informalities: As currently written, claim 45 is dependent on cancelled claim 1. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 24 – 28, 30 – 39 and 43 – 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Booth (US 5,418,063) in view of Kawasaki et al (US 4,990,390) and Yeager (US 4,569,624) or Flonc et al (US 5,080,851). The rejection of record (see Paper No. 8, paragraph 6, dated 11/1/02) is maintained.

Booth teaches a method of making a grid-like carbon-carbon composite by weaving together strands of carbon fabric formed of bundled carbon fibers impregnated with a carbon-containing matrix. The matrix is cured and then pyrolized to a temperature sufficient to carbonize the matrix material. After densifying the matrix, the composite is heated to an elevated temperature sufficient to graphitize the matrix material (Col. 3, lines 3 – 44). Booth does not suggest the thickness of the grid-like preform at the intersection points to be the same as the thickness of the adjoining

portions. Furthermore, Booth appears to be silent as to placing said preform in a mold to cure the matrix.

As to the thickness of the preform at the intersecting points, Kawasaki et al. teach a carbon fiber grid comprising intersecting fiber bundles impregnated with a resin material. Referring to Figures 18 – 20, Kawasaki et al disclose intersection points having a similar thickness in comparison to the rest of the composite. Furthermore, Kawasaki et al teach pressing the intersection points so that the bulge at the intersecting section is compacted to the same thickness as the other sections of the grid (Col. 3, lines 25 - 29). Kawasaki et al suggest that pressing acts to greatly improve the strength and durability of the intersecting section and reduces the thickness of the entire grid (Col. 4, lines 21 – 33).

It would have been obvious to one of ordinary skill in the art at the time of the invention to press the intersecting sections of the carbon fiber grid-like composite of Booth so that the intersecting sections have the same thickness as the rest of the composite as such is known as taught by Kawasaki et al to improve the strength and durability of carbon fiber grid composites at their intersecting points.

As to the employment of a mold, Booth suggests stacking the preimpregnated carbon strands to form the preform and curing the resin by any suitable technique (Col. 3, lines 31 – 44). As is suggested by Yeager, it is known to employ a mold to cure the resin in a preimpregnated carbon-carbon composite lay-up, wherein the shape of the mold conforms to the geometric form of the product being formed (Col. 4, lines 9 – 41). It therefore would have been obvious to one of ordinary skill in the art at the time of the

invention to cure the carbon strands of Booth in a mold as Booth suggests curing the resin by any suitable technique, wherein the use of a mold to cure is a conventional technique as evidenced for example by Yeager for curing carbon/carbon composite and only the expected carbon-carbon composite product of Booth would be formed.
As an alternative to the preimpregnated lay-up and curing technique as suggested by Booth and Yeager, it would have been obvious to one of ordinary skill in the art to alternatively employ a resin transfer molding technique to form the cured preform of Booth and only the expected composite would be formed. One of ordinary skill in the art would be motivated to consider a resin transfer molding to better position and handle the carbon strands in forming the grid-like product of Booth. As evidenced by Flonc et al's teaching of a resin transfer molding process, one of ordinary skill in the art would readily recognize that upon employing the RTM method to form the composite of Booth, the carbon strands of Booth would be placed into a shaped mold in a dry state and resin would thereafter be injected into the mold and cured to form the shaped preform. Furthermore, Flonc et al suggest that stitching dry lays of the composite together prior to the resin transfer molding is a conventional technique to maintain the alignment and stabilize the fabric to prevent fraying (Col. 1, lines 15 – 20).

4. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Booth (US 5,418,063) in view of Kawasaki et al (US 4,990,390) and Yeager (US 4,569,624) or Flonc et al (US 5,080,851) as applied to claim 24 above, and further in view of Leoni et

al (US 5,152,949). The rejection of record (see Paper No. 8, paragraph 7, dated 11/1/02) is maintained.

As to the mold including flexible elements to aid in the removal of the preform, both Yeager and Flonc et al fail to positively suggest molds containing such flexible elements. However, molds comprising flexible elements are known as taught for example by Leoni et al in the resin transfer molding art. Leoni et al teaches a mold comprising a compliant mold subassembly, which further comprises conformable cauls and a flexible liner. The conformable cauls allow the mold subassembly to conform to the inner surface of the composite and facilitate the fabrication of composite articles having complex configurations. After curing, the molding apparatus is opened and the conformable cauls are removed, wherein their flexibility facilitates their removal. This flexibility is recognized as rendering the cauls deformable. It would have been obvious to one of ordinary skill in the art at the time of the invention to employ the mold of Leoni et al so as to provide a mold having a compliant subassembly that helps facilitate complex shaped composites and helps facilitate easy demolding of the complex finished composite article.

5. Claims 40 – 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Booth (US 5,418,063) in view of Kawasaki et al (US 4,990,390) and Yeager (US 4,569,624) as applied to claim 24 above, and further in view of Suokas et al (WO 92/11126). The rejection of record (see Paper No. 8, paragraph 8, dated 11/1/02) is maintained.

Booth fails to suggest using a thermoplastic matrix material. However, thermoplastic matrix materials are known alternatives to thermosetting matrix materials in carbon/carbon composites as suggested by Suokas et al. It would have been obvious to one of ordinary skill in the art at the time of the invention to alternatively use a thermoplastic matrix, such as PEEK, in the composite of Booth as thermoplastic matrixes are known alternatives to thermosetting matrices as disclosed by Suokas et al, wherein one of ordinary skill in the art would be motivated to employ thermoplastic matrices over thermosetting matrices for the excellent physical and chemical properties of thermoplastics, including that their processing is based on heat and pressure, so that they are considerably faster to manufacture than thermosets and because thermoforming can be repeated several times, broken composites can be easily repaired.

Response to Arguments

6. Applicant's arguments filed 2-28-03 have been considered.

As to new claim 24, applicant argues that "Kawasaki et al obtains a substantially constant thickness but utilizes a different method that than presently claimed. Kawasaki et al uses pressure in order to reduce the thickness at the intersection points, thus incurring the risk of breaking the fibers at the intersection points." In contrast, applicant argues that in the present invention "a preform is used having a substantially constant material thickness or fiber volume at the intersection points, and considerable force is not necessary to provide a grid with constant cross-section." This argument appears to

not be commensurate in scope with the claimed invention. Independent claim 24 recites, "obtaining an integral fiber preform...having a substantially constant material thickness and/or volume content at the at least one intersection or node point and adjoining portions of the preform". "Obtaining" appears to be broad in scope and is not limited to a preform having constant cross-section without providing considerable force as applicant argues. It is noted that applicant's disclosure suggests producing the fiber preform by tailored fiber placement (Specification, page 4, lines 17 – 23). If claimed to define the manner in which applicant's obtain the integral fiber preform having a substantially constant material thickness and/or volume content at the at least one intersection or node point and adjoining portions of the preform, such would appear to overcome the prior art of record. That is the teaching to Kawasaki et al, while recognized as suggesting to use pressure to form constant thickness at the intersecting point and therefore "obtains" an integral fiber preform having constant material thickness at the intersection point, Kawasaki et al does not suggest tailored fiber placement to obtain constant thickness and/or volume content at the node points.

As to the rejection against claim 6, applicant argues that the secondary reference to Leoni et al "does not disclose that voids are surrounded by elements which are flexible and follow a shrinkage of the fiber composite component." Again, this is not commensurate in scope with the claimed invention. New claims 28 and 29, recite a mold die having mold voids defined by flexible elements, which when removing said blank from the mold voids, these flexible elements are deformed. These claims fail to define flexible elements that follow a shrinkage of the fiber composite component.

Leoni et al is cited as an exemplary teaching in the molding art that it is know to include flexible elements within the mold that conform to the surfaces of the composite being molded to facilitate the fabrication of composite articles having complex configurations. Furthermore, Leoni et al teach that after the molding operation is complete, the elements are removed more easily due to their flexibility. It is recognized that Leoni et al do not positively teach molding grid-like fiber composite structures, however one of ordinary skill in the art would have been motivated to look to teaching of Leoni et al as such is a general teaching of resin transfer molding methods for composite articles having complex configurations that one of ordinary skill in the art would readily appreciate to have applicability to a number of molding procedures for various shaped composite structures, including a grid-like preform.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Todd J. Kilkenny** whose telephone number is **(703) 305-6386**. The examiner can normally be reached on Mon - Fri (9 - 5).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Ball can be reached on (703) 308-2058. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

TJK

Michael W. Ball
Supervisory Patent Examiner
Technology Center 1700

TJK
April 23, 2003